REMARKS

This is in response to the Office Action mailed on <u>November 29, 2005</u>, and the references cited therewith.

Claims 1-30 are pending in this application.

Double Patenting Rejection

Claims 1, 5, 11 and 18 were rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 1 of U.S. Patent Application No. 09/751,955. This rejection is respectfully traversed.

To establish an obviousness-type double patenting rejection, the Examiner has the burden to show that (1) the inventions claimed (2) are not patentably distinct and (3) are based on a prima facie showing of obviousness. The Office Action specifically states that the claims are different in the way that slack is allocated. The claims in the present application allocate slack to tasks in different time partitions, while the other cited application is stated to base the allocation on priority. These are very different allocation schemes on their face, and the only evidence presented is conclusory, and not based on art: "It would have been obvious to one or ordinary skill in the art that the slack of the system be allocated based on different time set in order to determine which time gets the slack first. The two systems are capable of performing the same outcome therefore, they are not patentably distinct from each other." No comparison of the similarities of the allocation schemes has been made to support the bald assertion that they are obvious in view of each other. Further, the Office Action indicates that they are capable of performing the same outcome and therefore are not patentably distinct. There is no assertion of what this "outcome" is, and whether they perform it in the same way. Thus, the Office Action has failed to recite a proper prima facie case for obviousness-type double patenting, and the rejection should be withdrawn.

The rejection is not ripe for examination, as U.S. Patent Application No. 09/751,955 has not yet issued. Thus, the claims are not being rejected in view of a claim in an issued patent. Applicant does not admit that the claims are obvious in view of Patent Application No. 09/751,955. However, Applicant reserves the right to submit a Terminal Disclaimer in

compliance with 37 CFR 1.321(b)(iv) to obviate these rejections should claims in both cases become allowed, and the rejection not be withdrawn.

§103 Rejection of the Claims

Claims 1-30 were rejected under 35 USC § 103(a) as being unpatentable over Atlas et al. ('Slack Stealing Job Admission Control) in view of Frankle et al. (5,521,837) hereinafter Frankle. This rejection is respectfully traversed on several grounds. Some of those grounds include the fact that neither reference describes executing tasks in different time partitions, Frankle is non-analogous art, and there is no proper suggestion to combine the references.

Atlas discloses a slack-stealing job admission control system for scheduling periodic firm-deadline tasks with variable resource requirements. See Abstract. The Examiner admits that, and Applicants are unable to find mention of any teaching of the use of different time partitions. However, the Examiner then indicates that "Frankle teaches the use of setting different time partitions (Fig. 8; col. 3 lines 53-60; col. 5 lines 36-50; col. 7 lines 30-65; and col. 9 lines 45-55), and that it would have been obvious to one skilled in the art to combine the teachings of Frankle and Atlas to ensure different time partitions have access to slack. By being able to allocated slack to different time partitions the user can determine which tasks get the slack first, thus making the entire system more efficient."

First, it should be noted that Frankle non-analogous art, and is related to laying out circuits. It is not even remotely related to a slack stealing algorithm, thus failing to address a problem remotely related, much less similar to slack stealing. As such, no one of skill in the art would begin to look to Frankle for improving Atlas. The rejection should be withdrawn on this basis alone.

Second, the references to Frankle have absolutely nothing to do with time partitioning. Thus, neither reference teaches, discloses or suggests, alone or combined, the concept of time partitioning. In particular, each reference to Frankle is now separately addressed.

"Fig. 8 shows slack available at each connection determined from the actual and required arrival times..." Col. 11, lines 1-2. Frankle defines slack at Col. 7, lines 10-28 as room to spare in a physical connection of a logic design. In other words, if a signal alone a connection has time to spare, "The room to spare is called slack." Such a connection can be rerouted to a longer

route if it allows shortening of a route that needs to be shortened. This has absolutely nothing to do with the claimed scheduling of tasks, nor allocating slack to tasks in different time partitions.

Col. 3 lines 53-60 describe placement of logic design units, and again has nothing to do with the claimed scheduling of tasks, nor allocating slack to tasks in different time partitions.

Col. 5 lines 36-50 describes design decisions involved in laying out logic blocks, wires, and devices. It has nothing to do with the claimed scheduling of tasks, nor allocating slack to tasks in different time partitions.

Col. 7 lines 30-65 describes calculating slack (extra time available from some physical paths as described above) for connections of a path, and has nothing to do with the claimed scheduling of tasks, nor allocating slack to tasks in different time partitions.

Col. 9 lines 45-55 describes calculating path delay limits in a layout, and has nothing to do with the claimed scheduling of tasks, nor allocating slack to tasks in different time partitions.

Thus, each reference referred to in the Office Action indicating that Frankle describes time partitioning in fact refers to a different type of slack than the present application, and makes no mention of time partitions. The rejection should be withdrawn as at least one element is lacking from the combination.

Applicant respectfully points out that the Examiner has failed to provide any specific basis (i.e. column or page, and line number) within either reference for the limitation "allocating slack to tasks in different time partitions". Thus, even if the references are combined, the combination does not teach or suggest each and every claim element. To establish a *prima facie* case of obviousness under 35 U.S.C. '103, the prior art reference (or references when combined) must teach or suggest every limitation of the claim. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA, 1974). MPEP '2143.

The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *M.P.E.P.* § 2142 (citing *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed.Cir. 1991)). **No reasonable expectation of success in combining the references has been pointed to by the Examiner.** Neither reference contains any disclosure concerning "executing tasks in different time partitions". Thus, there is no indication within the references themselves that combining them would succeed in producing the claimed invention. Frankle's concept of slack

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is based on path lengths, and the length of time it takes a signal to propagate down the path. It has nothing to do with slack associated with tasks, and there is no suggestion in Frankle that it could be so applied.

Therefore, Applicants respectfully assert that a *prima facie* case of obviousness has not been established. First, the Examiner has not provided any teaching, suggestion, or motivation to combine the references from the prior art. Second, the Examiner has not provided any credible teaching, suggestion, or motivation in the knowledge generally available to one of ordinary skill in the art, to combine the Atlas and Frankle references to arrive at Applicants' claimed subject matter. Third, each and every element has not been shown in the references, alone or combined, and fourth, no reasonable expectation of success in combining the references has been established.

For any of the above reasons, independent claim 1 should be found to be allowable over any combination of Atlas and Frankle, and Applicants respectfully request that the rejection of claim 1 under 35 U.S.C. '103(a) as being unpatentable over Atlas in view of Frankle should be withdrawn.

If an independent claim is nonobvious under 35 U.S.C. '103, then any claim depending therefrom is nonobvious. MPEP '2143.03.

Claims 2-4, which depend from claim 1, directly or indirectly, and incorporate all of the limitations therein, are also asserted to be allowable for the reasons presented above.

Further, claim 2 recites that the tasks that are allocated slack are aperiodic, non-essential tasks. Atlas appears to be limited to only a static set of execution threads, i.e. a fixed set of recurring tasks without any new periodic tasks being activated and without any periodic tasks being deactivated. However, claim 2 recites that slack is allocated to aperiodic, non-essential tasks. The Office Action asserts that this is taught in Atlas at page 4 lines 19, 23-24, and 36-37. Atlas, references aperiodic tasks in passing comments about other work, but specifically indicates that "We use slack stealing to admit jobs of variable length." And "For SSJAC, we do not use any aperiodic servers;" in section 3.2, paragraphs 1 and 3 on page 4. Thus, it does not teach the limitations of claim 2 and the rejection should be reversed.

Claim 3 recites that tasks are allocated slack are from the group consisting of new non-essential tasks and enhancements to essential tasks. The Office Action indicates that this is

shown in Atlas at page 4 lines 19, 23-24, and 36-37. No such teaching is seen at the referenced lines. Only periodic jobs of variable length appears to be referenced, as well as various priorities of jobs. Since this element appears to be lacking from the references, the rejection should be reversed.

Claim 4 recites that both timeline slack and reclaimed slack are determined. The Office Action references page 4 lines 19, 23-24, and 36-37, and page 5, lines 13-17. These sections of Atlas have been reviewed, and no reference to those types of slack were found.

Independent claims 5-6, 10-11, 14-15, 18, and 19, along with their associated dependent claims, were rejected essentially based upon the same grounds as independent claim 1. Applicants respectfully assert that these claims are all patentable over any suggested combination of Atlas and Ezer for the reasons presented earlier regarding independent claim 1. Applicants respectfully requests that the rejection of claims 1-30 under 35 U.S.C. §103(a) as being unpatentable over Atlas in view of Frankle should be reversed.

Independent claim 5, in addition recites the scheduling of tasks to execute in different time partitions. This element is not shown in either reference. Neither Atlas nor Frankle contemplate different time partitions.

Independent claim 6 collects unscheduled execution time from one time partition and allocates unscheduled execution time to a task in another time partition. This type of scheduling is clearly not described in the references, and is not addressed in the Office Action.

Claim 7 depends from claim 6 and in addition recites that the tasks that are allocated slack are aperiodic, non-essential tasks. Atlas appears to be limited to only a static set of execution threads, i.e. a fixed set of recurring tasks without any new periodic tasks being activated and without any periodic tasks being deactivated. However, claim 2 recites that slack is allocated to aperiodic, non-essential tasks. The Office Action asserts that this is taught in Atlas at page 4 lines 19, 23-24, and 36-37. Atlas, references aperiodic tasks in passing comments about other work, but specifically indicates that "We use slack stealing to admit jobs of variable length." And "For SSJAC, we do not use any aperiodic servers;" in section 3.2, paragraphs 1 and 3 on page 4. Thus, it does not teach the limitations of claim 2 and the rejection should be reversed.

Claim 8 depends from claim 7 and further recites that tasks are allocated slack are from the group consisting of new non-essential tasks and enhancements to essential tasks. The Office Action indicates that this is shown in Atlas at page 4 lines 19, 23-24, and 36-37. No such teaching is seen at the referenced lines. Only periodic jobs of variable length appears to be referenced, as well as various priorities of jobs. Since this element appears to be lacking from the references, the rejection should be reversed.

Claim 9 depends from claim 6 and further recites that both timeline slack and reclaimed slack are determined. The Office Action references page 4 lines 19, 23-24, and 36-37, and page 5, lines 13-17. These sections of Atlas have been reviewed, and no reference to those types of slack were found.

Claim 10 is a machine-readable medium version of claim 6 and distinguishes from the references for at least the same reasons.

Claim 11 recites a time partitioned system that determines available slack from timeline slack and reclaimed slack, pools it in a common pool, and allocates slack from the common pool to tasks. This claim is believed to distinguish the references for at least the same reasons as claim 1, and further because the combination of references does not teach or suggest allocating slack in a time partitioned system from a common pool. The rejection should be reversed.

Claims 12 and 13 depend from claim 11 and distinguish the references for at least the same reasons. Further, they recite features similar to claims 2 and 3, and distinguish the references for the same reasons such claims distinguish the references.

Claim 14 is a machine-readable medium claim similar to claim 11, and distinguishes the references for at least the same reasons.

Claim 15 is similar to claim 11, and further allocates slack to a task in any time partition. Since neither reference describes time partitions for tasks, the rejection should be reversed.

Claims 16 and 17 depend from claim 15, and in addition distinguish the references in a manner similar to claims 2 and 3.

Claim 18 is a machine-readable medium version of claim 15, and distinguishes the references for at least the same reasons.

Claim 19 is a system claim that recites a processor the executes essential and non-essential tasks, each task having a worst case execution time, and an executive that determines

available slack and allocates it to tasks in different time partitions. This claim distinguishes the reference for at least the same reasons as claim 1, and further includes the worst case execution times. No reference to such is found in either of the references. Since this element is missing from the references, the rejection should be reversed. It should also be noted that claim 19 describes essential and non-essential tasks. Essential tasks by definition must be executed within a given period of time. Atlas deals with quality of service (QoS) for tasks, and does not describe the concept of an essential task. It is difficult having systems certified as capable of ensuring essential tasks are completed on time. The superposition of slack stealing on top of that requirement greatly increases the complexity of a slack stealing algorithm, because it cannot interfere with the completion of essential tasks.

Claims 20-20 depend from claim 19, and distinguish the references for at least the same reasons.

Claim 20 depends from claim 19, and further references determining slack from the group of timeline slack, reclaimed slack and idle time. It distinguishes from the references for the same reasons as claim 4 and claim 19.

Claim 21 depends from claim 20 and further references maintaining a pool of available slack. It distinguishes for at least the same reasons as claim 20, and further no pool of slack from different time partitions is taught anywhere in the references.

Claim 22 is believed to distinguish the references for at least the same reasons as claim 1, and further because the combination of references does not teach or suggest allocating slack in a time partitioned system from a common pool for use by tasks in any time partition. The rejection should be reversed.

Claims 23 and 24 depend from claim 19 and distinguish the references for at least the same reasons. Further, they recite allocating slack to tasks that are non-essential, new-nonessential tasks, and enhancements to essential tasks. No reference in the text identified in the Office Action in Atlas references essential and non-essential tasks. Thus, a prima facie case of obviousness has not been established, and the rejection should be reversed.

Claim 25 references a module that assigns priority to tasks. The Office Action refers to page 5 of Atlas as showing a module that assigns priority levels to different tasks. The language referred to however, relates to job admission control, as stated in the heading for the referenced

section. This section describes how jobs are admitted based on priority, and does not describe how tasks are assigned a priority. Since priority may be defined for a tasks by a programmer, there is not teaching or suggestion in Atlas of a module that assigns priority levels to tasks. Thus, a prima facie case of obviousness has not been established, and the rejection should be reversed.

Claim 26 depends from claim 25, and further describes how the first module determines available slack for tasks at each priority level. The language in Atlas referenced in the Office Action does not describe any mechanism for determining slack at each priority level. Rather, Atlas appears to reference available slack, and uses the available slack each time a job is tested to determine whether it can enter the system and run, as described on page 5. Thus, there is no determination of slack at each priority level, only a total of all slack available is maintained. Since this element is lacking from the references, the rejection should be reversed.

Claim 27 also depends from claim 25, and further allocates available slack to tasks in order or priority. As indicated with claim 26, slack is allocated to each job as it is scheduled to run. Available slack is given away "on a FCFS basis.", as stated in Atlas on page 5. The Atlas algorithm "does not directly schedule based upon task criticality." However, a resource threshold T can be used to assign different thresholds based on criticality. This appears to be an indirect way of attempting to inject some prioritization into an algorithm that does not inherently take it into account. Thus, it does not meet the langauge of claim 27, which expressly allocates slack to tasks in order of priority, and the rejection should be reversed.

Claim 28 indicates that the system is a flight control system. The Office Action admits that the references do not disclose a flight control system, but indicates that it would be obvious to include a flight control system in the references because it will increase the filed of use for such references. This statement is respectfully traversed. An affidavit or reference is requested to show that this would be within the skill in the art at the time the invention was made.

Claim 29 indicates that the system is a real-time control system. The Office Action indicates that this shown in Atlas at "page lines 5-8" Applicant has reviewed lines 5-8 of every page of Atlas, and fails to find a reference to a real-time control system. Thus, it is not believed that Atlas describes this claim element, and particularly not in a time-partitioned system.

Claim 30 depends from claim 19, and further references a single set of slack variables and a single slack table. This rejection is respectfully traversed, as the Examiner appears to be combining a description of prior art systems as described in the related work section starting on page 2 of Atlas, with the system described by Atlas. There is no suggestion to combine them. Further, Atlas does not describe a single slack table, but merely refers to available slack. There is a mention of potentially storing "level-I inactivity time for every $\tau_{i,j}$. If the values are stored in a table, the table must cover a hyperperiod of jobs.....In our implementation, we calculate each job slack when that job is released." This language does not teach the use of single slack table, and also does not reference a single set of slack variables. As such, the rejection should be reversed.

Applicant respectfully points out that the references are not at all related to each other in spite of sharing the term, "slack". Atlas at least uses the term in a manner similar to the presently claimed invention except that it clearly does not address the time partition aspects of the claimed invention. Frankle uses the term, "slack" in reference to fixed path lengths in a logic design, and the amount of time it takes a signal to travel down the path. This use is very far removed and not at all analogous Atlas and the present application. Thus, it in addition to all the reasons provided above, Frankel is non-analogous art, and it is improper to combine it with Atlas. Still further, neither reference describes "executing tasks in different time partitions" as clamed.

Conclusion

Applicant respectfully submits that the claims are in condition for allowance, and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney at (612) 373-6972 to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.
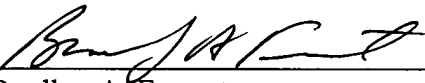
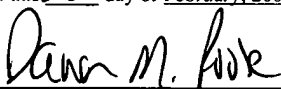Respectfully submitted,

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